Charles Steinmetz and LC

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1 Introduction

This paper references the book "Electric Discharges, Waves and Impulses, and other Transients" written by Charles Proteus Steinmetz [1] and the paper entitled "Steinmetz Analogy Between Magnetic and Dielectric" written by Lori-Anne Gardi [2].

2 L and C

Beginning with the following two equations (Steinmetz):

$$L = \frac{\phi}{i} \tag{1}$$

$$C = \frac{\psi}{e} \tag{2}$$

where L is Henry, ϕ is phi, i is ampere, C is capacitance, ψ is psi and e is the elemenatary charge. Phi is taken as the proportionality constant for volt, and psi (twice phi) as the proportionality constant for coulomb.

$$phi = \phi = \frac{1+\sqrt{5}}{2} = 1 : 1.6180339... \tag{3}$$

$$psi = \psi = 1 + \sqrt{5} = 1 : 3.2360679... \tag{4}$$

Changing the subject to that of the fine structure constant (the elementary charge is the square root of the fine structure constant), the recommended CODATA value (2018) for the fine structure constant is $1 : 0.0072973525693(11)$.

$$\frac{\phi^2}{1:360} = a = 1 : 0.007272316... \tag{5}$$

where a is the fine strucure constant. Knowing the elementary charge is the square root of the fine structure constant:

$$e = \sqrt{1} : 0.007272316 = 1 : 0.08527787... \tag{6}$$

Now returning to eq. 2:

$$C = \frac{\psi}{e} = 1 : \sqrt{1,440} \tag{7}$$

As psi (ψ) is twice phi(ϕ), it is suggested that i (eq. 1)is twice e.

$$L = \frac{\phi}{i} = 1 : \sqrt{90} \tag{8}$$

$$LC = 1 : 360 \tag{9}$$

References

[1] Charles Proteus Steinmetz. *Elementary lectures on electric discharges, waves and impulses and other transients.* McGraw Hill, 1911, pp. 10–13.

[2] Lori Gardi. *Steinmetz Analogy Between Magnetic and Dielectric.* May 2019.